

GAO

United States General Accounting Office

Briefing Report to Congressional
Requesters

AD-A282 797



June 1994

NAVY SHIPS

Seawolf Cost Increases and Schedule Delays Continue



2005 94-24002



United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-250714

June 30, 1994

The Honorable Edward M. Kennedy
Chairman, Subcommittee on Regional
Defense and Contingency Forces
Committee on Armed Services
United States Senate

The Honorable John Conyers, Jr.
Chairman, Legislation and National
Security Subcommittee
Committee on Government Operations
House of Representatives

As you requested, we are providing information on the status of the Navy's Seawolf class nuclear-powered attack submarine detail design and lead ship construction as of December 1993. On June 1, 1994, we briefed your staffs on the results of our work. This report contains the information presented at that briefing (see app. I).

BACKGROUND

In 1984, the Navy planned to buy 29 Seawolf submarines to counter the former Soviet Union's new generation of quieter, more capable submarines. In April 1987, the Navy awarded Tenneco's Newport News Shipbuilding and Drydock Company in Newport News, Virginia, a \$303 million cost plus fixed-fee contract for the overall class design and detail design of the submarine's forward half. As part of this contract, Newport News awarded General Dynamics' Electric Boat Division, Groton, Connecticut, a subcontract for the detail design of the submarine's rear half. In January 1989, the Navy awarded Electric Boat a \$636.8 million fixed-price incentive-fee contract (in fiscal year 1987 dollars) to build the lead ship, SSN-21. Subsequently, Electric Boat estimated inflation would add \$81.2 million to the construction cost, bringing the total estimate to \$718 million in then-year dollars. Construction of the SSN-21 began in October 1989, with delivery originally scheduled for May 1995.

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In August 1990, the Department of Defense (DOD) reduced the number of submarines to be procured from 29 to 12 due to the changed national security threat brought on by the demise of the Soviet Union and defense budget constraints. In January 1992, the Bush administration announced plans to terminate the Seawolf program after the first submarine. However, Public Law 102-298 (fiscal year 1992) explicitly rejected the administration's revision proposal and, among other actions, restored funding to construct SSN-22. DOD's October 1993 Report on the Bottom-Up Review endorsed the production of a third Seawolf submarine (SSN-23) to preserve the industrial base. This submarine will be built by Electric Boat with fiscal year 1995 or 1996 funding.

Our most recent report, which provided a 1-year snapshot of the program as of December 1992, showed that contracts for Seawolf class detail design and SSN-21 construction were experiencing cost increases and schedule delays.¹ At that time, Newport News estimated that detail design costs would total about \$683 million (then-year dollars) when completed, a \$28 million increase (4 percent) since December 1991 and a \$380 million (125 percent) increase over the original \$303 million contract cost estimate. Electric Boat estimated SSN-21 construction would cost about \$1.1 billion (then-year dollars) when completed, a \$64 million (6 percent) increase since December 1991 and a \$385 million (54 percent) increase over the \$718 million (then-year dollars) contract estimate.

Our report also showed that the detail design was behind schedule and that SSN-21 construction was about 40 percent complete and 5 to 6 months behind schedule. Major factors that contributed to construction delays included late design data, late materials, late preparation and release of work packages (i.e., instructions and materials needed for construction), and a smaller-than-planned SSN-21 construction workforce.

RESULTS IN BRIEF

Seawolf detail design and SSN-21 construction continued to experience cost increases and schedule delays during 1993. The estimated total cost of detail design and lead ship

¹Navy Ships: Problems Continue to Plague the Seawolf Submarine Program (GAO/NSIAD-93-171, Aug. 4, 1993).

construction increased about \$17 million (2.5 percent) and \$39 million (3.5 percent), respectively. Design cost increases were caused by rescheduling drawing issue dates to meet Electric Boat's requirements, design inefficiencies associated with that effort, and paying overtime. Factors contributing to construction cost increases included increases in direct labor, increases in overhead, and additional work.

The detail design contract fell an additional 15,000 hours behind schedule due to delays preparing design drawings and integrated logistics support data. SSN-21 construction fell 4 months behind the construction schedule, which was revised in March 1993. According to Electric Boat and Navy Seawolf program officials, late design data, an eroding industrial vendor base, and late material contributed to construction delays. Although the Navy is concerned about the continuing smaller-than-expected SSN-21 construction workforce, Electric Boat, the Seawolf program manager, and DOD believe that corrective actions initiated by Electric Boat will result in recovering construction delays and meeting the SSN-21's revised May 1996 delivery schedule. The Supervisor of Shipbuilding at Electric Boat, however, continues to be concerned with the Electric Boat's ability to recover the construction delays.

SCOPE AND METHODOLOGY

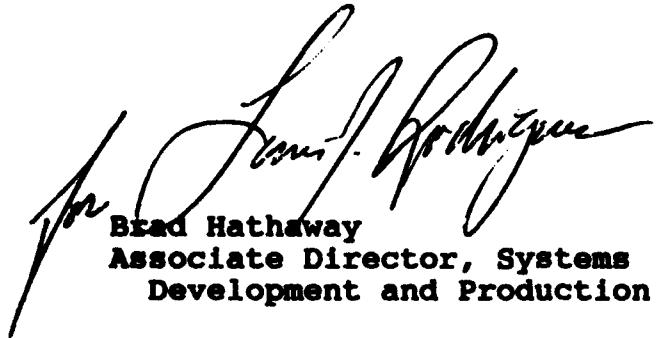
We reviewed and analyzed Navy assessments and contractor cost, schedule, performance, and staffing reports. We met with Navy officials in Washington, D.C., who are responsible for detail design and SSN-21 construction. We also met with officials from Newport News Shipbuilding and Drydock, Newport News, Virginia, and Electric Boat Division in Groton, Connecticut; and the Navy's Supervisor of Shipbuilding and Repair offices at the two shipyards. We conducted our monitoring effort from June 1993 to April 1994.

DOD provided written comments on a draft of this report, which appear in appendix II. DOD generally concurred with the information presented but clarified two issues. First, DOD emphasized that, even though schedule data showed that SSN-21 construction was 4 months behind the March 1993 schedule, additional factors lead DOD to be hopeful that the SSN-21 will be delivered on schedule in May 1996.

Second, DOD commented on efforts to address the decline in the submarine industrial base.

We are sending copies of this report to the Chairmen of the Senate and House Committees on Armed Services and on Appropriations and the Secretaries of Defense and the Navy. Copies will also be made available to others on request.

Please contact me at (202) 512-4841 if you or your staff have any questions concerning this report. Major contributors to this report are listed in appendix III.



for *Brad J. Hathaway*

Brad Hathaway
Associate Director, Systems
Development and Production Issues

GAO Briefing for Congressional Requesters

**STATUS OF THE NAVY'S SEAWOLF CLASS
DETAIL DESIGN AND SSN-21 CONSTRUCTION EFFORTS
AS OF DECEMBER 1993**

June 1, 1994

DETAIL DESIGN AND CONSTRUCTION COST INCREASES

Then-year dollars in millions

Description	Contractors' estimate at completion			
	Dec. '92	Dec. '93	Increase	Change
Detail design	\$683	\$700	\$17	+2.5%
Construction	1,103	1,142	39	+3.5%

- Primary factors for the \$17 million increase in detail design include design inefficiencies associated with rescheduling drawing issue dates to meet Electric Boat's requirements and paying overtime.
- Primary factors contributing to the \$39 million construction increase include increases in direct labor, increases in estimated franchise tax, environmental cleanup, data processing costs, additional work, and overhead increases resulting from the declining shipbuilding industry.

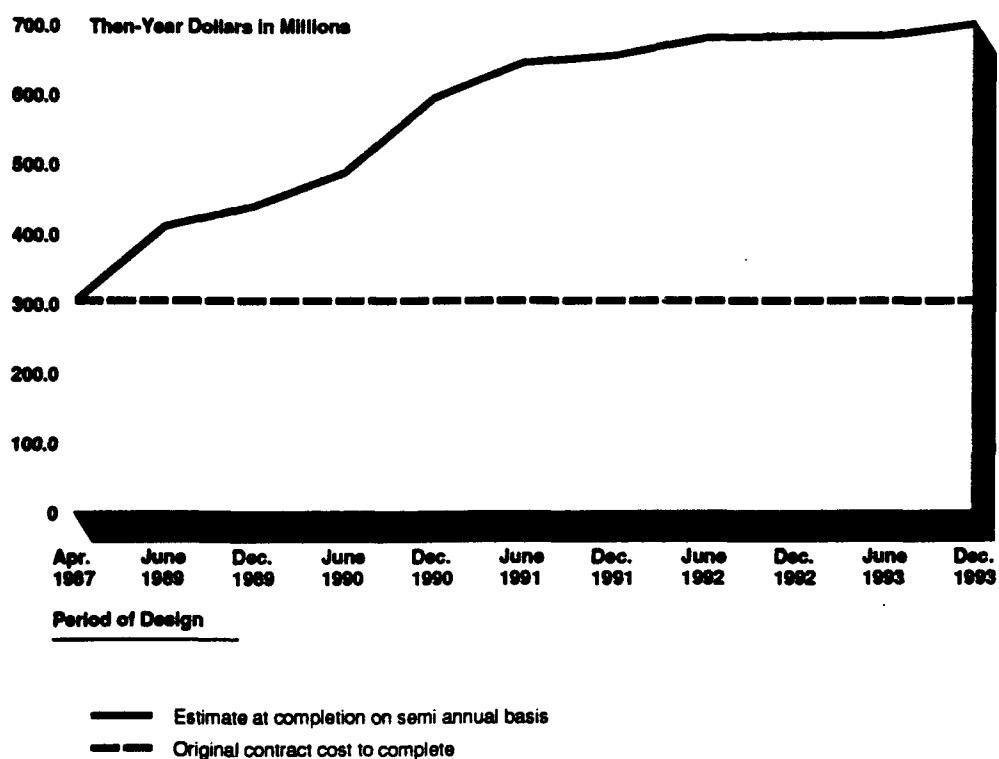
COMPARISON OF DETAIL DESIGN AND CONSTRUCTION CONTRACT AWARDS AND COST ESTIMATES AT COMPLETION

Then-year dollars in millions

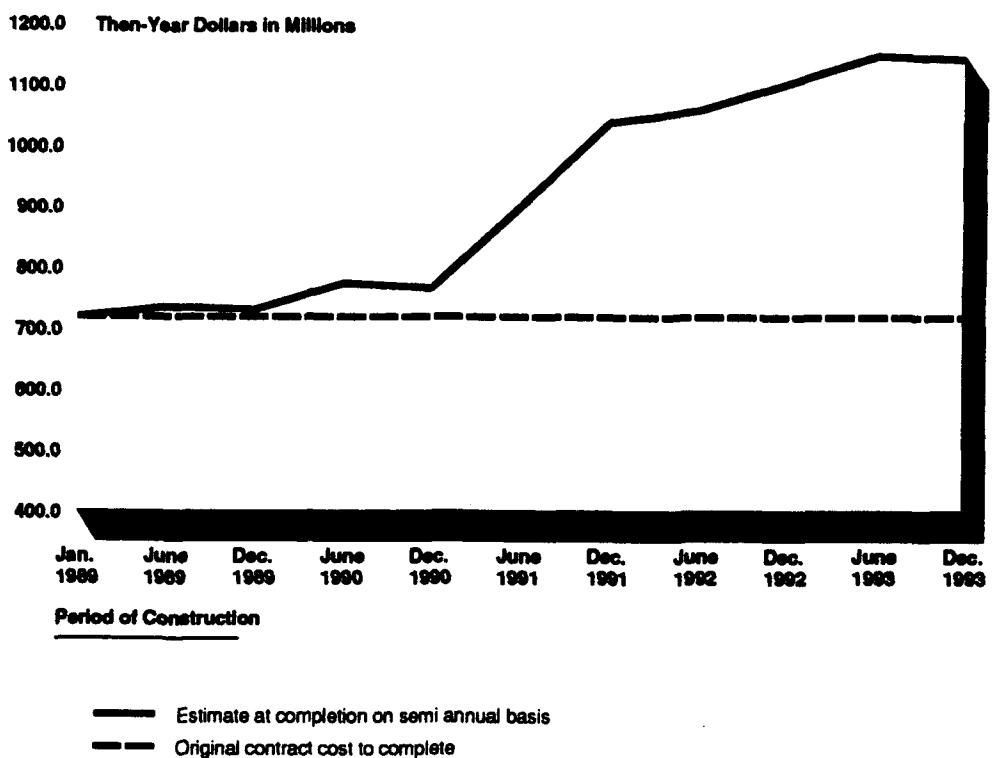
Description	Contract award	Dec. 1992 estimate at completion	Dec. 1993 estimate at completion	Percent increase over contract award
Detail design	\$303	\$683	\$700	131
Construction	718	1,103	1,142	59

- Newport News Shipbuilding's \$700 million estimate at completion represents a \$397 million increase since contract award in 1987. The increase consists of
 - \$219 million for contract changes, \$168 million of which was for the greater amount and complexity of work associated with modular construction than originally planned, and
 - \$178 million for cost overruns.
- Electric Boat's \$1,142 million estimated cost at completion represents a \$424 million increase since contract award in 1989. The increase consists of the following:
 - \$118 million for negotiated contract changes and adjustments, such as a 1991 \$58.8 million adjustment to replace all defective HY-100 steel weldings and a 1993 \$4.5 million adjustment due to late and unsuitable government furnished design data and the estimated cost of authorized, unpriced work.
 - \$200 million for estimated cost overruns at completion. The Navy's share would be about \$160 million, and Electric Boat's share would be about \$40 million.
 - \$106 million for increased inflation over the shipbuilder's original \$81.2 million estimate. Payments for inflation are not part of the construction contract.

COMPARISON OF ORIGINAL SSN-21 DESIGN TARGET COST TO NEWPORT NEWS' ESTIMATE AT COMPLETION



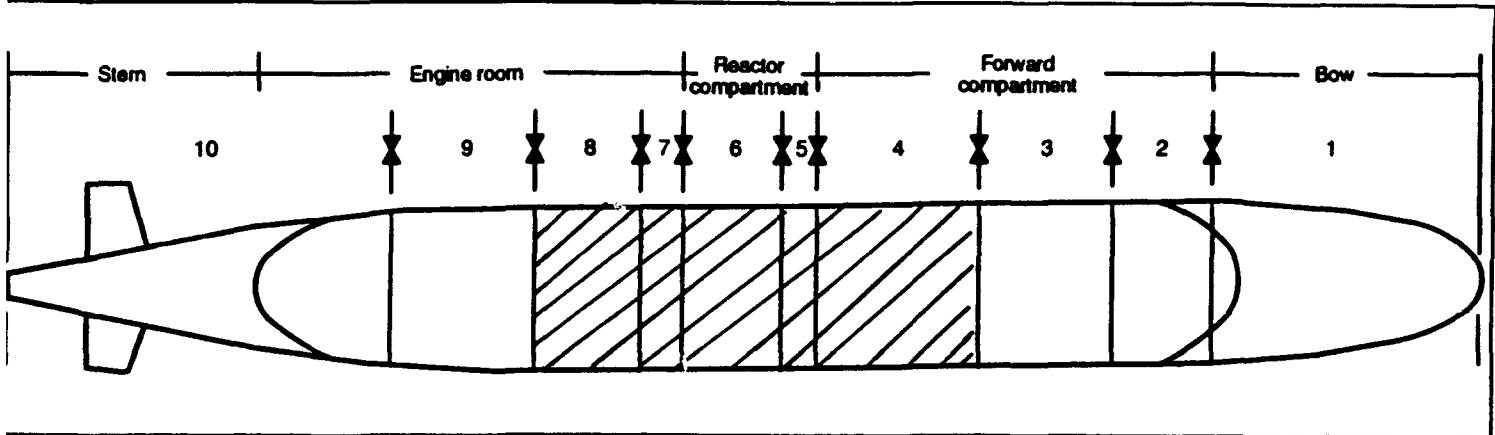
COMPARISON OF ORIGINAL SSN-21 CONSTRUCTION TARGET COST TO ELECTRIC BOAT'S ESTIMATE AT COMPLETION



DETAIL DESIGN SCHEDULE DELAYS

Description	Dec. 92	Dec. 93	Change	Increase
Cumulative hours behind schedule	511,000	526,000	+15,000	2.9%

- Most of the increase was related to delays preparing detail design drawings and integrated logistics support data.
- As of December 31, 1993, detail design was 91 percent complete.

SSN-21 COMPARTMENTS AND HULL SECTIONS (1 Through 10)

Pressure hull sections were delivered from Electric Boat's Rhode Island fabrication facility to its Connecticut assembly facility.

SSN-21 CONSTRUCTION SCHEDULE DELAYS

Period ending	Months behind construction schedule
December 1992	5-6
December 1993	4

- To recover construction delays and still meet the SSN-21's revised May 1996 delivery date, the shipbuilder implemented a revised construction schedule in March 1993.
- By the end of December 1993, construction was about 58 percent complete. Five of the 10 pressure hull sections (4 through 8) were delivered to the shipbuilder's assembly facility. However, two sections were not fully outfitted, as originally planned, due to late material.
- Navy and Electric Boat officials agreed that, despite construction delays, no serious construction problems--of the magnitude of the defective HY-100 steel welding--were known.
- Electric Boat, the Seawolf program manager, and the Defense Department believe that the shipbuilder's corrective actions will result in recovering construction delays and delivering the SSN-21 to the Navy in May 1996. The Supervisor of Shipbuilding at Electric Boat, however, continues to be concerned with the shipbuilder's ability to recover the schedule variance or construction schedule delays.

FACTORS CAUSING CONSTRUCTION DELAYS

Late design data	<p>Electric Boat's Seawolf program manager stated that late design data caused construction delays during part of the year. In addition, the manager and a Navy program official noted that the factors discussed below also caused delays.</p>
Erosion of vendor industrial base	<p>Navy and Electric Boat program officials stated that reduced SSN-21 class procurements made it increasingly difficult to maintain the vendor base to fully support the construction schedule and, in some cases, had caused construction delays. According to the Department of Defense, the decline of the submarine industrial base and the resulting uncertainty surrounding component vendors are two of the most significant factors contributing to cost and schedule growth.</p>
Late material	<p>According to Electric Boat and Navy program officials, by the end of 1993 late material was the most significant factor causing construction delays. Electric Boat's program manager stated that specific material requirements are not known until drawings are issued. A Navy program official stated that Electric Boat had not fully recognized and identified critical materials early or streamlined its material planning and acquisition process.</p>

COMPARISON OF UNDERSTAFFING FOR SSN-21 CONSTRUCTION WORKFORCE

1992 (Average)		1993 (Average)	
Actual workforce	Percent under plan	Actual workforce	Percent under plan
1,558	39	2,182	14

- Throughout 1993, the Navy was concerned that Electric Boat's SSN-21 construction staffing levels would not support the submarine's May 1996 delivery.
- Electric Boat officials stated that SSN-21 construction was understaffed because it committed construction staff only when design data and materials were available to minimize unnecessary rework and labor inefficiencies. The design data and material were received late.

COMMENTS FROM THE DEPARTMENT OF DEFENSEACQUISITION AND
TECHNOLOGY

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

24 JUN 1994

Mr. Frank C. Conahan
 Assistant Comptroller General
 National Security and International Affairs Division
 United States General Accounting Office
 Washington, D. C. 20548 :

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report "Navy Ships: Seawolf Cost Increases and Schedule Delays Continue," dated June 7, 1994 (GAO code 707079), OSD Case 9705. The DoD generally concurs with the report.

Since the GAO completed its audit work in April 1994, the shipyard has made significant progress. Key events such as the completion of joining and final welding of all hull sections, initial crew manning, and commencement of propulsion plant testing have all been completed early or on time. That progress increases the DoD confidence that the shipyard will meet the lead ship delivery schedule.

While DoD generally agrees with the information reported by the GAO, the Department would like to provide clarification of two issues--data interpretation and factors impacting the Seawolf cost and schedule. With regard to data interpretation, the GAO draft only reflects information from the cost and schedule control system. Although that data is correct, other available data shows that there has been substantial improvement in schedule performance since the last GAO report in August 1993. A cost and schedule control system schedule variance must be analyzed in conjunction with other schedule information such as provided by networks, Gantt charts and line-of-balance. By itself, schedule variance reveals no "critical path" information and may be misleading because unfavorable accomplishment in some areas can be offset by favorable accomplishment in others. Further analysis must be performed to determine the effect on cost and schedule. That additional analysis increases overall confidence that the May 1996 delivery date will be met.

Unfortunately, the GAO draft does not reflect that additional information. The GAO report implies there is a schedule slip, when actually the lead ship is still projected for a May 1996 delivery. The schedule variance projected by the cost and schedule control system data is improving. Some significant milestones indicating that improvement include the following:

- The weapons stowage and handling module was installed March 31, 1994--one day ahead of schedule.
- The final pressure hull weld was completed May 5, 1994--nine days ahead of schedule.
- The engine room event was achieved on schedule on April 8, 1994.
- Both the propulsion plant testing and initial crew manning occurred on schedule.
- The detailed design is 92 percent complete.

A simple measurement of ship completion is percentage of completed ship weight. The SSN 771 (which was one of the last ships in its class) achieved 74 percent of completed ship weight 13 months before float off. By comparison, the SSN 21 Seawolf also achieved 74 percent of completed ship weight at the same point in construction.

With regard to cost and schedule impacts, the GAO identified several factors, but did not identify a key factor that has contributed to both cost and schedule growth--the decline of the submarine industrial base and the resulting uncertainty surrounding component vendors. That factor has presented a significant challenge to Seawolf program management.

To address the problem, the Navy established a construction management team to respond to supply problems. The management team has developed plans and solutions to address various supply problems that have arisen and initiated procurement to assist the sole manufacturer of submarine atmospheric life support equipment to prevent terminal layoffs planned for March 1994.

Although Navy management has kept the lead ship on schedule, the workarounds necessary to deal with the inevitable supply problems has resulted in some inaccuracies in the cost and schedule control system data base. The effects of the continuing erosion of the submarine industrial base will require continued management attention to prevent schedule slippage and cost growth. The DoD, however, remains hopeful that the Seawolf will be delivered on schedule.

The DoD appreciates the opportunity to comment on the GAO draft report.

Sincerely,



Frank Kendall
Director
Tactical Warfare Programs

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